



REVISTA PAULISTA DE PEDIATRIA

www.spsp.org.br



CASE REPORT

Impact of a virtual reality-based intervention on motor performance and balance of a child with cerebral palsy: a case study

Silvia Leticia Pavão*, Joice Luiza Bruno Arnoni, Alyne Kalyane Câmara de Oliveira, Nelci Adriana Cicuto Ferreira Rocha

Universidade Federal de São Carlos (UFSCar), São Carlos, SP, Brazil

Received 11 February 2014; accepted 23 April 2014

KEYWORDS

Cerebral palsy;
Children;
Postural balance;
Psychomotor
performance;
Rehabilitation;
Virtual reality exposure
therapy

Abstract

Objective: To verify the effect of an intervention protocol using virtual reality (VR) on the motor performance and balance of a child with cerebral palsy (CP).

Case description: To comply with the proposed objectives, a 7-year old child with spastic hemiplegic cerebral palsy (CP), GMFCS level I, was submitted to a physiotherapy intervention protocol of 12 45-minute sessions, twice a week, using virtual reality-based therapy. The protocol used a commercially-available console (XBOX®360 Kinect®) able to track and reproduce body movements on a screen. Prior to the intervention protocol, the child was evaluated using the Motor Development Scale (MDS) and the Pediatric Balance Scale (PBS) in order to assess motor development and balance, respectively. Two baseline assessments with a 2-week interval between each other were carried out for each tool. Then, the child was re-evaluated after the twelfth session. The results showed no changes in the two baseline scores. After the intervention protocol, the child improved his scores in both tools used: the PBS score increased by 3 points, reaching the maximal score, and the MDS increased from a much inferior motor performance to just an inferior motor performance.

Comments: The evidence presented in this case supports the use of virtual reality as a promising tool to be incorporated into the rehabilitation process of patients with neuromotor dysfunction.

© 2014 Sociedade de Pediatria de São Paulo. Published by Elsevier Editora Ltda. All rights reserved.

*Study conducted at the Universidade Federal de São Carlos, São Carlos, SP, Brazil.

*Corresponding author.

E-mail: silvia_pavao@hotmail.com (S.L. Pavão).

PALAVRAS-CHAVE:

Paralisia cerebral;
Criança;
Equilíbrio postural;
Desempenho
psicomotor;
Reabilitação;
Terapia de exposição à
realidade virtual

Impacto de intervenção baseada em realidade virtual sobre o desempenho motor e equilíbrio de uma criança com paralisia cerebral: estudo de caso

Resumo

Objetivo: O estudo buscou verificar o efeito de um protocolo terapêutico baseado em realidade virtual (RV) sobre o desempenho motor e o equilíbrio funcional de uma criança com paralisia cerebral (PC).

Descrição do caso: Uma criança com PC hemiplégica espástica de 7 anos, nível de GMFCS I, foi submetida a um protocolo de intervenção fisioterapêutica de 12 sessões de 45 minutos, numa frequência de duas vezes semanais, com o uso de terapia baseada em RV. Utilizou-se um console comercialmente disponível (XBOX®360 Kinect®) capaz de rastrear a movimentação corporal, reproduzindo-a em uma tela. Anteriormente à intervenção, foram realizadas avaliações de seu desenvolvimento motor e equilíbrio por meio dos instrumentos: Escala de desenvolvimento Motor (EDM) e *Pediatric Balance Scale* (PBS), respectivamente. Foram realizadas duas avaliações com espaço de uma semana como linha de base e uma reavaliação após as 12 sessões. Não foram observadas diferenças nos escores dos instrumentos nas duas avaliações iniciais. Depois do protocolo de intervenção, o paciente aumentou o escore do instrumento PBS em três pontos, atingindo o teto da escala e, no instrumento EDM, passou de um desempenho motor muito inferior para apenas inferior.

Comentários: As evidências apresentadas pelo presente relato apoiam o uso da RV como uma promissora ferramenta a ser incorporada no processo de reabilitação de paciente com disfunções neuromotoras.

© 2014 Sociedade de Pediatria de São Paulo. Publicado por Elsevier Editora Ltda. Todos os direitos reservados.

Introduction

Acquired brain injuries, such as hypoxic-ischemic lesions up to the age of three, are among the ten main causes of spastic hemiplegic cerebral palsy (CP).¹⁻² Although it does not severely impair functionality in children, hemiplegic motor impairment produces neuromotor alterations that cause precision deficits in movement performance and deficits in postural control, which is responsible for the stability and alignment between the body segments during the performance of activities.³ Thus, the rehabilitation of children with mild motor impairment of the hemiplegic type may prove to be especially challenging to therapists, requiring profound technical knowledge and creativity.⁴⁻⁵

The presence of neuromotor impairments in hemiplegic CP and its high incidence in the pediatric age range⁵ justify the development of studies assessing the effect of therapeutic interventions on the balance and quality of postural responses in these children,⁶⁻⁸ aiming to determine the most effective approaches in functional recovery. In this sense, virtual reality (VR)-based therapy is an increasingly acknowledged interactive tool used for patient immersion in a virtual environment.⁹⁻¹¹

VR provides patients with simplified feedback about the position of their bodies in space¹² and allows them to interact with virtual components in real time,¹³ stimulating the learning of adaptive motor control strategies in response to stimuli.^{8, 14} The motivation and the ability to customize the therapy provided by the contact with the virtual environment^{15, 16} make VR an important rehabilitation tool,

which offers sensorimotor experiences that are otherwise unfeasible in common therapies.

Studies have shown improvement in manual function and cortical organization in children with CP after VR-based therapies;¹⁷⁻¹⁸ however, although there are studies using VR-based therapy in children with CP, most of them use interfaces with the virtual environment through gloves¹⁷ or controls with accelerometers.¹⁸⁻²⁰ Few studies have used VR in the rehabilitation of children with CP through the use of commercial body movement tracking systems.²¹⁻²³

Commercial body movement tracking systems such as the XBOX®360 Kinect® (Microsoft®, New York, United States) contain sensors that capture the child's movements in three dimensions, creating images that can be viewed by the individual on a TV screen. This projection allows interaction with the virtual environment through body movement. This is an interesting feature, considering the upper limb impairment seen in children with CP, which could prevent the use of gloves and remote controls in their treatment. Chang *et al*²² observed the effect of VR-based therapy using the XBOX®360 Kinect® on hand function of children with CP. The authors used specific movements for the upper limbs, checking positive effects of this treatment modality in children with moderate motor impairment. Luna-Oliva *et al*²³ also found positive effects of using the Kinect as an adjunct therapeutic tool on motor function in children with mild and moderate motor impairment.

However, although these studies have demonstrated the benefits of using video games with body motion tracking as a therapeutic adjuvant,²²⁻²³ the evidence found is still limited, especially regarding its use in children with low

Download English Version:

<https://daneshyari.com/en/article/4176288>

Download Persian Version:

<https://daneshyari.com/article/4176288>

[Daneshyari.com](https://daneshyari.com)